



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

VARIATION IN THE VENATION OF TRIMEROTROPIS.

JEROME McNEIL.

A RECENT study of nearly all the known species (fifty out of fifty-four) of the orthopteran genus *Trimerotropis* has afforded the writer an opportunity to note the amount of variation which occurs in the venation of the tegmina and wings of a single genus. Three out of the four subfamilies of Acrididæ found in North America north of Mexico, *i.e.*, Acridinæ, Tryxalinæ, and CEdipodinæ, present but a single and little modified type of venation well represented by the *Tr. vinculata* Scud (Figs. 1, 2).

The remaining subfamily, Tettiginæ, is so extremely different as to show little relationship to Acrididæ. In all the drawings the terminology used is that of Comstock and Needham, with the very slight modifications necessary to adapt it to Orthoptera. The homologies have been determined by the writer from a study of the tracheation of the tegmina and wings of nymphs, which is to be published shortly.

It will be noticed by those familiar with this nomenclature that the branches of *R.* have been named as if they were accessory branches entirely, whereas it is very probable that some of them represent the primary forks of that vein. At present it is impossible to be quite certain of these homologies, so that the simplest way of naming them has been employed without claiming for it complete accuracy.

VARIATIONS WITHIN A SPECIES.

For the purpose of studying the variation within the limits of a single species I have selected *Tr. saxatilis* McN., a species from Arkansas and southern Illinois, and one of the three species known to occur east of the Mississippi. This form was not selected because of its being unusually variable in venation,

but because I had a larger number of specimens (fifty-seven) of this than of any other species, and these were all collected during the same season in four or five counties of northwest Arkansas, except three, which came from Union County, Illinois. At the same time it is well to note that it is more variable in color than any other species known to me. It frequents stony surfaces exclusively, and its colors vary with the colors of the stones. On black rocks it is nearly black in color, while on

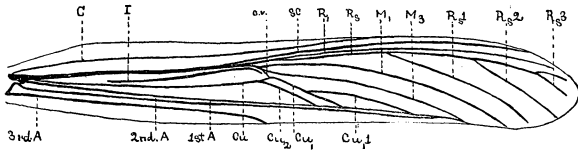


FIG. 1.

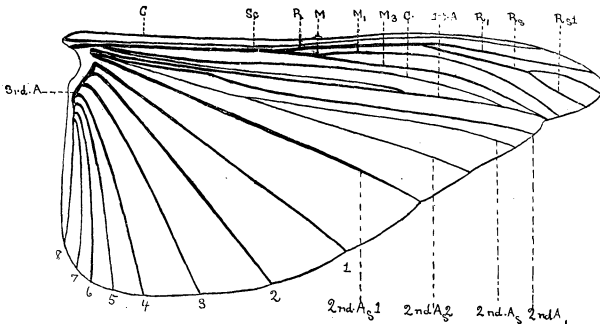


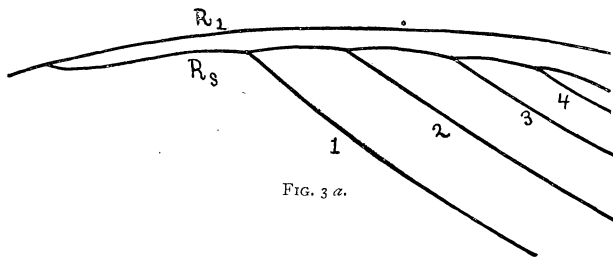
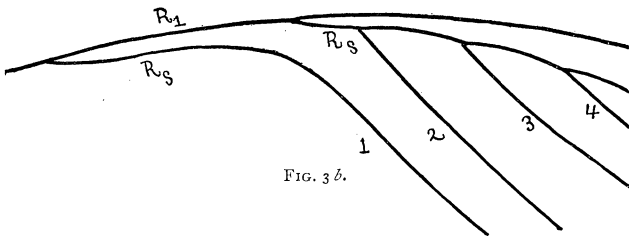
FIG. 2.

C., costa; *Sc.*, subcosta; *R.*, radius; *R*₁, first fork of radius; *R*₂, radial sector; *R*₃ 1, 2, etc., 1st, 2d, etc., branches of *R*₂; *M.*, media; *M*₁, first and second forks of *M.* fused; *M*₃, third and fourth forks of *M.* fused; *I.*, intercalary; *c.v.*, cross-vein at end of area *M.*; *Cu.*, cubitus; *Cu*₁, first fork of cubitus; *Cu*₂, second fork of cubitus; *Cu*₁ 1, 2, first and second forks of *C*₁; *Cu*₂ 1, first fork of *C*₂; 1st *A.*, first anal vein; 2nd *A.*, second anal vein; 2nd *A*₁, first fork of 2nd *A.*; 2nd *A*₂, sector of 2nd *A.*; 2nd *A*₃ 1, 2, first and second forks of the sector of the second anal vein; 3rd *A.*, third anal vein; 3rd *A.*, 1-8, accessory branches of 3rd *A.*

The tegmina and wings are divided by the principal veins and their branches into areas which take the name of the vein or branch immediately anterior.

hillsides covered with black and white lichen-covered fragments of chert it is colored black, white, and green, so that away from its environment it is a very conspicuously colored insect. It will require, however, more extended observations than I have been able to make to know whether or not there is any relation between variation in coloration and venation.

In the tegmina *C.* and *Sc.* are simple veins which do not vary in such a manner as to be readily noted; the former is about halfway between the anterior margin and the three succeeding veins, which are so closely approximate on the proximal half of the tegmina as to appear one vein to the unaided eye. *R.* is quite variable, though *R*₁ does not share in this variation. *R*_s has normally three branches in the male and four in the female, but of the fifty-seven specimens examined six males have four branches and one male has two, and eight

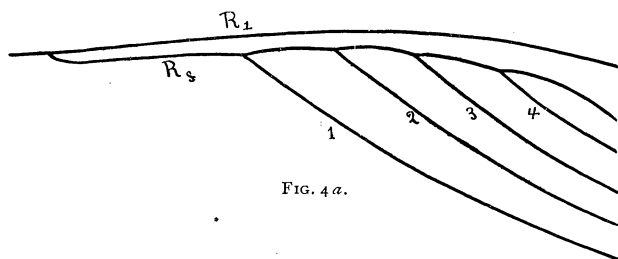
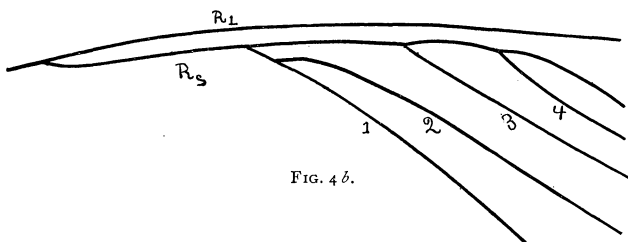
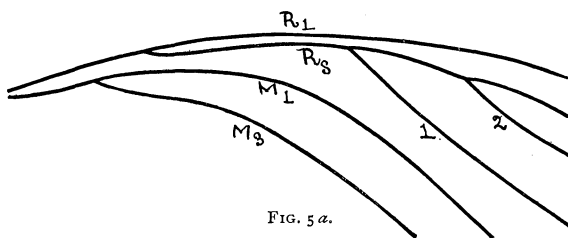
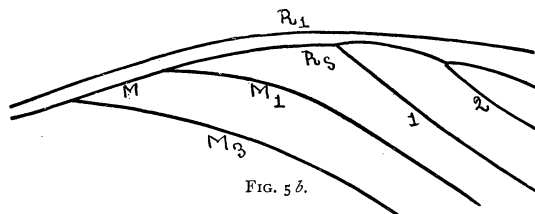
FIG. 3 *a*.FIG. 3 *b*.

females have three branches; thus about 24 per cent show irregularity in this respect. Within the genus the variation which normally occurs in the number of branches of *R.* is exactly the same; within the subfamily the range is considerably greater, being but one in *Celes* and six in *Pachytylus*, both old-world genera. In a single instance the apical part of *R*_s with two branches has lost its connection with the basal part with one branch, and the former is separately connected to *R*₁ (Figs. 3 *a*, 3 *b*).

No similar variation is normal in the genus nor within the subfamily, so far as I know. The second branch of *R*_s may

lose its connection with R_s and become attached to the first branch (Figs. 4 *a*, 4 *b*).

This arrangement is abnormal in the genus and probably in the subfamily, and occurs but once in the fifty-seven speci-

FIG. 4 *a*.FIG. 4 *b*.FIG. 5 *a*.FIG. 5 *b*.

mens; but in this case the irregularity is present in both tegmina. In a single instance, also, the third branch in one tegmen forks. Finally, in three specimens, two males and one female, R_s leaves R_1 and becomes attached to M_1 (Figs. 5 *a*, 5 *b*).

This occurrence is common in *Psinidia eucciata*, if it is not the rule, and it seems to be natural to *Cedaleus*. The fork of *R.* is quite variable in position. Generally it is one-third the width of the tegmina at this point distad of *M.* fork, but in three cases it is more than one-half, while in one instance it is more than once, and in another one-eighth, the width of the

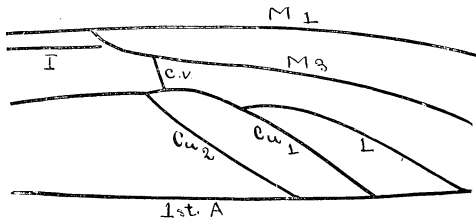


FIG. 6 a.

tegmina distad of the same point. This is certainly equal to any similar variation normal to the genus and is rarely exceeded in genera of the subfamily. *M.* has two simple forks, *M*₁ and *M*₃, which do not vary conspicuously. The fork of *M.*, however, which is usually decidedly proximad of the fork of *Cu.*, in four females and two males, is parallel with it or even slightly distad. In a single instance the cross-vein, which is always

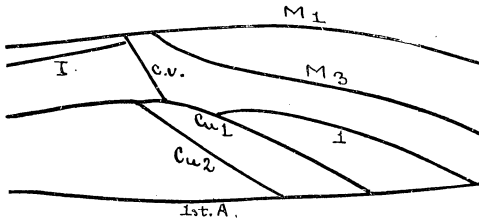
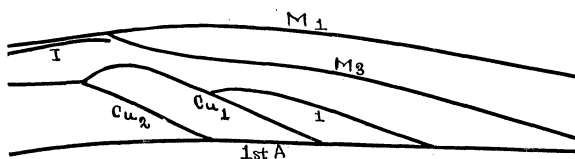
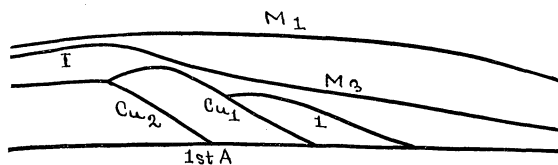


FIG. 6 b.

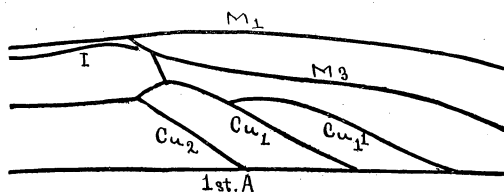
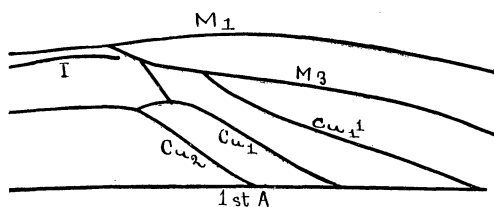
present at the outer end of area *M.*, and which usually, in the genus as well as in the subfamily, when present, connects *M*₃ and *Cu*₁, joins the main stem of *M.* with *Cu*₁ (Figs. 6 a, 6 b).

The intercalary vein, which is usually separated apically from *M.* by once, male, or two or more times, female, its width, has this relation reversed in a single female and seven males.

In one specimen M_3 loses its connection with M_1 and appears to be a continuation of I . (Figs. 7 *a*, 7 *b*).

FIG. 7 *a*.FIG. 7 *b*.

Cu is quite variable, typically; Cu_1 has a single anterior branch which leaves the stem near the base, but in one specimen this branch is joined to Cu_1 below its middle, and in one case there are two branches on one side. In the genus there

FIG. 8 *a*.FIG. 8 *b*.

are never fewer than one, nor more than two, branches normally. In one female in one tegmen the branch of Cu_1 is transferred to M_3 (Figs. 8 *a*, 8 *b*).

1st *A.* and 2nd *A.* are simple veins, whose variations are not easily noted; but 3rd *A.*, while usually simple and free to the posterior margin or with its apex lost among the numerous cross-veins of the anal area, is definitely connected apically with 2nd *A.* in four males and two females. In all cases except one this fusion is common to the two tegmina. This is the rule in *Chortophaga*.

In the Wing.

As in the tegmina, *C.* and *Sc.* are simple and vary little; the former occupies the costal margin; the latter is approximate to, or fused with, *C.* on the distal one-half or one-third of the wing; *R*₁ remains simple. *R*_s varies greatly, while it generally has one branch; in five males and one female it has none,

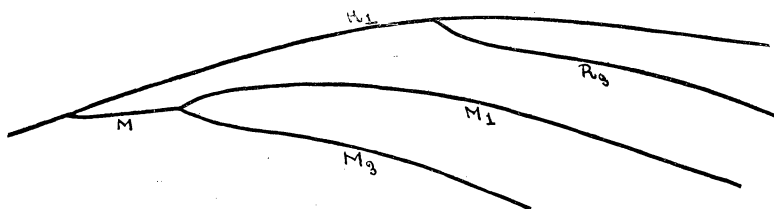


FIG. 9 a.

and this is the usual condition in *Encoptotaphus*, *Chortophaga*, and *Derotmema*. This branch of *R*_s varies from less than one-fourth the length of *R*_s in two males and one female to more than one-half in five males and four females; when normally developed it is about one-third. *R.* fork should be halfway

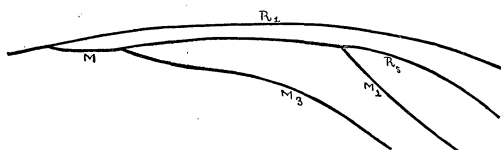
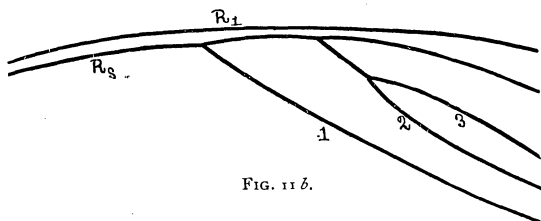
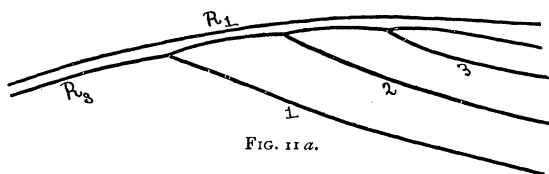
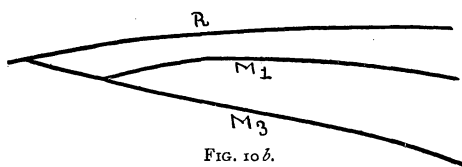
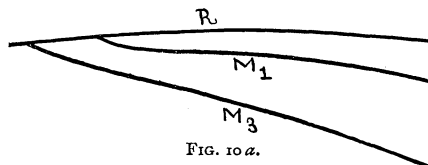


FIG. 9 b.

from the union of *M.* and *R.* to the tip of the wing. In numerous specimens it is a little more, and in two males and two females less, than one-third of the way. In two males *R*_s has no branch and is connected with *M*₁ instead of *R*₁ (Figs. 9 a, 9 b).

The union of R_s with M_1 in the wing is characteristic of the genus *Dissosteira* (except *D. venusta* Stal). M_1 is also quite variable. Its forks are always simple, but in four males they join R . separately (Figs. 10 *a*, 10 *b*).

Usually, the stem of M . before it branches is rather more than the width of the area M .; but in five males and two females it is less than once as wide, in this respect resembling



the genus *Arphia*; and in seven males and five females it is more than twice as wide, which is the usual condition in the genus *Hippiscus*. *Cu. 1st A.*, *2nd A.*, and *2nd A.* offer no easily noted variations; but the union of *2nd A.* 2 with *2nd A.* may be, apparently, distant from the base as much as two-fifths, or as little as one-fourth, the length of the latter. When the distance is less than two-fifths, however, a diagonal cross-vein at this point indicates the normal connection of the vein and its branch.

In conclusion it may be said that the variations in the tegmina and wings of one side average nearly two in the females and rather more than two in the males, as variations on one side are generally repeated upon the other; the average num-

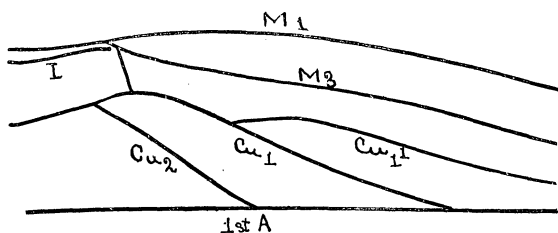


FIG. 12 a.

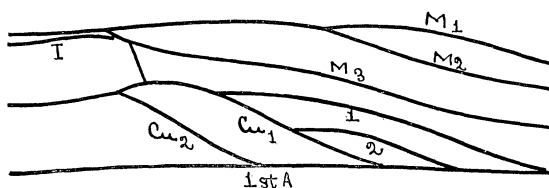


FIG. 12 b.

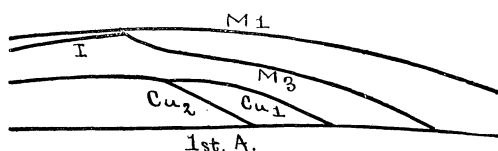


FIG. 13 a.

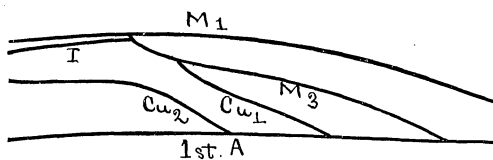


FIG. 13 b.

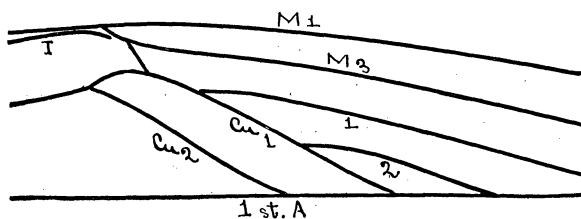
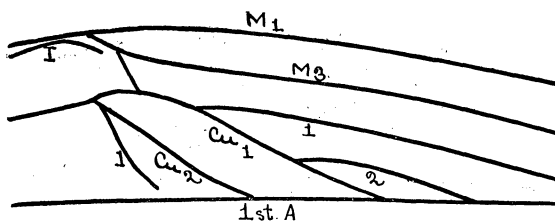
ber on both sides would be not much less than four. There were almost exactly three variations in the tegmina to two in the wings.

VARIATIONS WITHIN THE GENUS.

In addition to the variations which have already been mentioned as occurring in *Tr. soxatilis* the following have been

noticed, one or more times, in other species of the genus. In *Tr. lanta* the second and third branches of R_s have a common stem (Figs. 11 *a*, 11 *b*).

In *Tr. azurescens*, M_1 may fork (Figs. 12 *a*, 12 *b*).

FIG. 14 *a*.FIG. 14 *b*.

In *Tr. albolineata*, Cu_1 loses its connection with Cu_2 and becomes attached to M_3 (Figs. 13 *a*, 13 *b*).

Unless the tegmina figured by Saussure¹ is abnormal, this is the usual condition in the genus *Scintharista*. In the species *Tr. vinculata*, Cu_2 may be branched (Figs. 14 *a*, 14 *b*).

GENERAL CONCLUSIONS.

1. Variations in venation which occur within a single species are much greater than those differences which distinguish one genus from another. That is to say that many of the variations which occur are not restricted to what are commonly considered specific limits, but are such as are paralleled only in widely separated genera of the subfamily, and some of them do not normally occur within the limits of the subfamily.

2. Variations in venation which occur in the various species

¹ Saussure, H. de. *Prodromus Edipodionum*, Pl., Fig. 10. Geneva, 1884.

of the genus merely serve to strengthen the conclusion just formulated, and, except in the number of branches of radius in the tegmina and wings, are greater than normally occur in the subfamily.

3. Variation affects chiefly the veins R_s , M ., and Cu . in the tegmina, and R_s and M . in the wings, and these on the outer half of the wings only.

4. Variation in venation is more frequent in the tegmina than in the wings.

5. When the tegmina are widened, new veins are supplied by accessory branches of R_s and Cu_1 .